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SUPPORTING TUVALU'S MOVE TOWARD 100% RENEWABLE ENERGY

A \$2.1 million grant through ESMAP's Small Island Developing States (SIDS) DOCK¹ Support Program is playing a key role in helping Tuvalu achieve energy security through clean energy. The grant enables the country to reduce its dependence on imported fossil fuel used to generate power and to improve the efficiency and sustainability of its electricity system. The project co-financed by ESMAP will provide the country's largest solar PV facility, increasing the production of electricity through solar PV from 8 percent to 20 percent. It will also be the first installation of battery energy storage systems (BESS) in the island nation. ESMAP support has been instrumental in the technical design and enhancement of the client's capacity to implement the project through two additional workstreams: An additional \$1.2 million has provided funding for Pacific Island utilities' technical studies that have been critical in the design of this solar PV facility and others in Micronesia and the Marshall Islands; and a \$3.5 million ESMAP grant is co-financing a regional project, providing the enabling environment for the Pacific Island utilities' readiness toward the clean transition.

DIESEL PRICES AND LOOMING CLIMATE CHANGE INSPIRE TUVALU'S NEW ENERGY GOAL

The Pacific Island state of Tuvalu carries the precarious risk of being one of the first countries to be submerged by sea level rise due to global warming. This has spurred policy makers to set a long-term goal to generate 100 percent of its electricity from renewable sources, breaking a dependence on expensive, polluting diesel fuel. The average cost of electricity in the Pacific Islands is about five times higher than in the United States. The high cost poses a real challenge for Tuvalu's population, whose income mainly relies on fisheries, tourism, or work abroad, requiring the government to subsidize utility costs.

Antiquated and inefficient diesel-run generators currently produce 92 percent of Tuvalu's electricity, with an additional 8 percent generated from solar. Blackouts—most often the result of shortages of fuel and spare parts—are a frequent occurrence.

Together, policy makers and the utility weighed pros and cons to find balance among the following options:

- Solar PV being the least cost option versus the expense of solar PV with BESS
- A 100 percent renewable energy goal with the risk of making the grid more unstable
- Limited land area to support solar PVs
- Determine whether private finance should be explored or if the market is too small

¹ SIDS DOCK is an initiative among member countries of the Alliance of Small Island States (AOSIS) to help SIDS transform their energy sectors and address adaptation to climate change. To help this transition, the SIDS DOCK Support Program was launched by ESMAP with funding from the governments of Denmark and Japan. The SIDS DOCK Support Program, a multidonor trust fund administered by ESMAP, is implemented in partnership with UNDP. It is called SIDS DOCK because the initiative is designed as a "DOCKing station" to connect the energy sector in SIDS with the global market for finance, sustainable energy technologies, and with the European Union and US carbon markets.

TRANSFORMING TUVALU THROUGH THE ENERGY SECTOR DEVELOPMENT PROJECT

In 2014, the World Bank approved a \$7 million grant from the [International Development Association \(IDA\)](#) for the [Tuvalu Energy Sector Development Project](#) to enhance Tuvalu's energy security by reducing its dependence on imported fuel for power generation and by improving the efficiency and sustainability of its electricity system. To support the project, [ESMAP's SIDS DOCK Support Program](#) contributed a \$2.1 million grant, which played an instrumental role in funding solar PVs, BESS, and grid communication systems. This project in Tuvalu is a prime example of the program's work in supporting the SIDS countries' transformation of their energy sectors to address climate change.

"The SIDS DOCK initiative for Tuvalu supports investments in renewable energy and energy efficiency, thereby reducing the country's dependence on imported fuel for power generation. The highly volatile cost of fuel has proven very costly to the utility, and the government and the SIDS DOCK initiative certainly is embraced," said Avafoa Irata, CEO of Tuvalu's Ministry of Transport, Energy, and Tourism.

Due to Tuvalu's limited land area, the solar panels will run along the landing strip at Tuvalu's airport alongside the soccer field. The contract price for the solar PV facility was about \$5 million, with the remaining funding provided by IDA.

The project will provide the country's largest solar PV facility (750 kW PVs connected to 1 MW peak system) and its first BESS (2 MWh lithium ion battery). It also includes the installation of around 1,500 prepayment meters for all Tuvalu Electricity Corporation (TEC) customers to improve bill collection contributing to the utility's financial sustainability and to allow customers to track their electricity usage. These investments will reduce fuel consumption by increasing the country's solar energy penetration from 8 percent to 20 percent, create energy efficiency awareness among users through the prepayment meters and energy efficiency campaigns, and lead to a more sustainable, reliable energy system in the long term.



Source: Takayuki Doi, World Bank.

As of October 2020, 60 percent of the equipment to build the solar installation (solar PVs, battery, pre-payment meters, and high frequency radio) has been delivered and stored. Installation will take place as soon as COVID-19 travel restrictions are lifted, allowing the contractors to enter the country. The project's closing has been extended to September 30, 2022.

"The SIDS DOCK financial assistance is timely in achieving the government of Tuvalu's 100 percent renewable energy target by 2025."
—Mr. Mafalu Lotolua, General Manager, Tuvalu Electricity Corporation



Source: Takayuki Doi, World Bank.

TECHNICAL ASSISTANCE FOR ENERGY TRANSFORMATION IN THE PACIFIC ISLANDS

ESMAP also supported technical assistance activities, including a study on variable renewable energy (VRE) grid integration for all of the Pacific Island country utilities, as well as workshops focusing on developing the technical and institutional capacity of the Pacific Island utilities, which also served to identify gender gaps in the sector.

To determine the technical and economic viability of VRE and the requirements to integrate these resources into the Pacific Islands, an additional \$1.2 million from ESMAP-funded technical studies helped design different projects in the Pacific Islands, including Tuvalu, Micronesia, and the Marshall Islands. These studies helped identify the requirement of grid support by incorporating BESS to reliably integrate solar PV systems.

The technical assistance and capacity-building activities are linked to the first World Bank-funded engagement in the energy sector on a regional scale in the Pacific Islands. Their focus is on enhancing the capacity of the utilities to incorporate and manage renewable energy technologies and long-term disaster risk planning.

The Sustainable Energy Industry Development Project, co-financed by the SIDS DOCK Support Program through a \$3.5 million grant, supported the Pacific Power Association (PPA) and the Pacific Island utilities. This project focused on:

- Developing guidelines for grid-connected solar PV and BESS.
- Developing an online benchmarking platform to enhance data collection for better power system planning and decision-making.



Source: Takayuki Doi, World Bank.

- Conducting workshops and training for the utilities to enhance their ability to operate renewable energy, in particular by creating guidelines/standards on renewable energy and energy efficiency for the design and operation and maintenance (O&M) of their systems. These technical guidelines have now become a reference point in the Pacific Islands; they can be found here.

This collective effort has helped the utilities become more familiar with solar PV and BESS assets, leading to Tuvalu's successful procurement of the solar PV facility (750 kW solar and 2 MWh BESS), the first commercial-scale installation of solar PV in Micronesia, and the Marshall Island's successful procurement of the 4 MW solar and 1 MWh BESS.

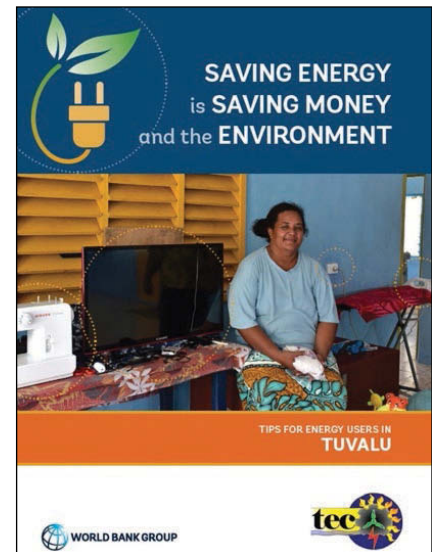
OTHER ESMAP-SUPPORTED ACTIVITIES IN TUVALU

Gender and Energy

Tuvalu has benefited from ESMAP's Gender and Energy (GE) Program, receiving technical support to ensure gender equality actions are fundamental in the energy sector's operations. In particular, the TEC is now committed to ensuring that men and women benefit equally from its services, helping to close gender gaps in the sector.

Knowledge sharing is key to fostering a better understanding of gender equality issues. To increase awareness, ESMAP's GE program prepared and distributed an energy efficiency pamphlet to the TEC customers. This knowledge piece explains the different ways energy issues affect women and men.

Through SIDS DOCK and ESMAP co-financing, the World Bank's Social Sustainability and Inclusion and Energy Practices in the East Asia and the Pacific region jointly supported the PPA to encourage and promote women in filling technical and managerial roles in the Pacific Island utilities (under the Pacific Regional Sustainable Energy Industry Development Project). The work began in 2017, with members developing a gender assessment and action plan for the PPA. Their work



Source: The World Bank.

facilitated a dialogue among members on why and how to increase women's employment in utilities across the Pacific Islands. Data to identify gender gaps were collected from all 25 of its members—including Tuvalu—and published on a web-based [gender portal](#) launched in 2018. The portal provides members' commitments, targets, progress, and resources to increase female employment and support policies and initiatives focused on broader workforce development; it also features [PPA Gender Champions](#) trained by the World Bank.

Moving forward, ESMAP is expanding its capacity to support the Pacific Island countries by launching the Gender Equality-SIDS Program—a subprogram under ESMAP's GE Program. Tuvalu is a candidate to benefit from this new direction, with its transformative opportunities, initiatives, and programs to foster women's employment and productive energy use.



Source: Takayuki Doi, World Bank.

LOOKING FORWARD

Installing easy-to-operate solar PV and BESS in Tuvalu will be a transformational milestone to reduce costs and produce clean and reliable energy, after a long reliance on diesel to fuel their power.

Other initiatives being considered are:

Floating Solar: To help the country reach their 100 percent renewable energy goal, a solar PV feasibility



Source: Takayuki Doi, World Bank.

study financed through the Tuvalu IDA project will be performed for a floating solar project in the Tuvalu lagoon where the water is calm and stable. The Marshall Islands are also considering floating solar due to limited land area, along with the concept of solar shade sidewalks that function both to provide shade and to protect pedestrians from the elements.

Electric Vehicles (EVs): The synergies between solar PV and EVs are being explored, and the regional activity funded by ESMAP began paving the way for the use of EVs. Some countries in the region have begun a pilot and are doing an analysis with several EVs, such as electric motorbikes in the Marshall Islands and Tuvalu. The EV work is continued through the Korea Green Growth Trust Fund (KGGTF).



Source: Takayuki Doi, World Bank.

ESMAP MISSION

The Energy Sector Management Assistance Program (ESMAP) is a partnership between the World Bank and 19 partners to help low- and middle-income countries reduce poverty and boost growth through sustainable energy solutions. ESMAP's analytical and advisory services are fully integrated within the World Bank's country financing and policy dialogue in the energy sector. Through the World Bank Group (WBG), ESMAP works to accelerate the energy transition required to achieve Sustainable Development Goal 7 (SDG7) to ensure access to affordable, reliable, sustainable and modern energy for all. It helps to shape WBG strategies and programs to achieve the WBG Climate Action Plan targets.